Claims:

1. A method for measuring a film (22) comprising:

irradiating the film (22) with a spatially periodic optical excitation field (3, 3') in order to generate a thermal grating;

generating a spatially periodic refractive index disturbance in a gas or liquid medium contacting the film (22) via heat transfer (25) from the film (22) to said medium;

diffracting a probe laser beam (6) off the refractive index disturbances in the said medium to form a signal beam (6');

detecting the signal beam (6') as a function of time to generate a signal waveform; and

determining at least one property of the film (22) based on the signal waveform.

2. The method of Claim 1, wherein the film (22) comprises a metal film.

3. The method of Claim 2, wherein the film (22) is a metal film with a thickness less than 100 angstroms.

4. The method of Claim 1, wherein the film (22) is deposited on an underlayer that is transparent to the excitation radiation.

5. The method of Claim 4, wherein the film (22) is deposited on the underlayer characterized by a smaller absorption coefficient at the excitation wavelength compared to the film material.

6. The method of Claim 1, wherein the medium in contact with the film is air.

7. The method of Claim 1, wherein the refractive index disturbance in the medium is associated with the acoustic wave.

8. The method of Claim 7, wherein the acoustic wave in the medium causes low frequency modulation (200) of the signal waveform.

9. The method of Claim 9 wherein the determining step is based on the analysis of the said low-frequency modulation (200) of the signal waveform.

10. The method of Claim 1, wherein the determining step comprises analysis of the signal waveform with an empirical calibration.

11. The method of Claim 1, wherein the determining step comprises analysis of the signal waveform with a theoretical model comprising calculation of optical absorption by the film (22);

analysis of thermal diffusion (25) causing temperature increase in the gas or liquid medium in contact with the film (22);

analysis of the acoustic wave excitation caused by the temperature increase;

analysis of the probe beam (6') diffraction off the refractive index disturbance caused by the temperature increase (25) and acoustic waves (27) in the medium.

12. The method of Claim 1, wherein the at least one property comprises a thickness of the film (22).

13. The method of Claim 1, wherein the at least one property comprises a presence of the film (22).